Claims

1. A semiconductor device comprising:

a plurality of transmission lines each formed of a ground wiring to have the ground potential and a power supply wiring to carry a power supply current with an insulating film interposed between the ground wiring and the power supply wiring; and

a transmission line element arranged to relay said power supply current carried between said transmission lines, said transmission line element being formed of both said ground wiring and said power supply wiring with an insulating film interposed between the ground wiring and the power supply wiring and said transmission line element also having a characteristic impedance sufficiently low as compared to the characteristic impedance of said transmission line.

2. The semiconductor device according to claim 1, wherein said transmission line element has a large capacitance such that the characteristic impedance thereof is low enough as compared to the characteristic impedance of said transmission line.

3. The semiconductor device according to claim 1, wherein said transmission line element has a transmission line length longer than one fourth of a wavelength corresponding to the lowest frequency in the frequency range intended for decoupling.

4. The semiconductor device according to claim 1, wherein said insulating film of said transmission line element has a dielectric loss as large

as the electromagnetic wave entered on said transmission line element is consumed as heat.

5. The semiconductor device according to claim 1, wherein said transmission line element has said ground wiring and said power supply wiring formed in a corrugated form with a separation thereof kept at a constant distance.

6. The semiconductor device according to claim 5, wherein said transmission line element has at least either depressions or protrusions on said ground wiring, said insulating film and said power supply wiring.

7. The semiconductor device according to claim 5, wherein said transmission line element is formed in a corrugated form with corrugations arranged in a direction perpendicular to said signal transmission direction.

8. The semiconductor device according to claim 5, wherein said transmission line element is formed in a corrugated form with corrugations arranged in said signal transmission direction.

9. The semiconductor device according to claim 5, wherein said transmission line element is formed in a corrugated form with corrugations arranged both in a signal transmission direction and in a direction perpendicular to said signal transmission direction.

10. The semiconductor device according to claim 5, wherein the

surfaces formed in a corrugated form of said ground wiring, said insulating film, and said power supply wiring of said transmission line element are each further formed in a form having a plurality of ridges

11. The semiconductor device according to claim 1, wherein said transmission line element is formed on a semiconductor chip.

12. The semiconductor device according to claim 1, wherein said transmission line element is implemented on a power supply lead for supplying a power supply current.

13. The semiconductor device according to claim 12, wherein said transmission line element is formed thinner than said transmission line implemented in said power supply lead.

14. A semiconductor circuit provided with a semiconductor device according to claim 11 or 12, and

a printed-circuit board mounted with said transmission line element and said semiconductor device.

15. The semiconductor circuit according to claim 14, wherein said transmission line element has a characteristic impedance to yield a variation in a direct-current power supply voltage applied to said power supply wiring to be 5 % or less.

16. The semiconductor circuit according to claim 14, wherein the

transmission line element mounted on a semiconductor chip of said semiconductor device has capacitive characteristics for the highest frequency of the high frequencies generated in said semiconductor chip,

the transmission line element mounted on the power supply lead of said semiconductor device has capacitive characteristics for the frequency range lower than the frequency range for the transmission line element mounted on a semiconductor chip, and

the transmission line element mounted on the printed-circuit board has capacitive characteristics for the frequency range lower than the frequency range for the transmission line element mounted on the power supply lead of said semiconductor device.

17. A method of fabricating a semiconductor device having

a plurality of transmission lines each formed of a ground wiring to have the ground potential and a power supply wiring to carry a power supply current with a first insulating film interposed between the ground wiring and the power supply wiring, comprising:

an element-forming step of forming a transmission line element arranged to relay said power supply current between said transmission lines, said transmission line element being formed of said ground wiring and said power supply wiring with a second insulating film interposed between the ground wiring and the power supply wiring and having a characteristic impedance sufficiently low as compared to the characteristic impedance of said transmission line.

18. The method of fabricating a semiconductor device according to

claim 17, wherein said element-forming step comprising the steps of:

forming said ground wiring;

patterning said ground wiring and forming the ground wiring in a corrugated form;

forming said insulating film on said ground wiring; and

forming said power supply wiring on said insulating film.

19. The method of fabricating a semiconductor device according to claim 17, wherein said element-forming step comprising the steps of:

forming said ground wiring;

patterning said ground wiring and forming corrugations arranged in a signal transmission direction and also in the direction perpendicular to said signal transmission direction on the ground wiring;

forming said insulating film on said ground wiring; and

forming said power supply wiring on said insulating film.

20. The method of fabricating a semiconductor device according to claim 17, wherein said element-forming step comprising the steps of:

forming said ground wiring;

patterning said ground wiring and forming the ground wiring in a corrugated form;

further forming depressions on the corrugated surface;

forming said insulating film on said ground wiring; and

forming said power supply wiring on said insulating film.

21. The method of fabricating a semiconductor device according to

claim 17, wherein said element-forming step comprising the steps of:

forming said ground wiring;

patterning said ground wiring and forming the ground wiring in a corrugated form;

further forming ridges on the corrugated surface;

forming said insulating film on said ground wiring; and

forming said power supply wiring on said insulating film.

22. The method of fabricating a semiconductor device according to claim 17, wherein said element-forming step comprising the steps of:

forming said ground wiring;

patterning said ground wiring and forming the ground wiring such that the ground wiring is formed in a corrugated form and further ridges are formed on the corrugated surface;

forming said insulating film on said ground wiring; and

forming said power supply wiring on said insulating film.

23. The method of fabricating a semiconductor device according to any one of claims 17 through 22, wherein said element-forming step comprising the step of forming said ground wiring in the position prescribed to relay the power supply leads for supplying said power supply current.

24. The method of fabricating a semiconductor device according to any one of claims 17 through 22, wherein said element-forming step comprising the steps of:

forming an insulating substrate on power supply leads for

supplying said power supply current;

forming said ground wiring on said ceramic substrate;

forming a through-hole in an insulating film provided as a separate piece from said insulating substrate;

forming power supply wirings on the top of said insulating layer, and from said top to the bottom section of said through-hole through the internal walls of said through-hole; and

affixing together said insulating substrate and said insulating film to connect the power supply wiring formed in the bottom section of said through-hole and the power supply wiring formed on said insulating film.